

WHAT IS CLAIMED IS:

1. A mixed conductor characterized by being a compound of an electron conductor made of an inorganic material and a proton conductor made of an inorganic material.
- 5 2. The mixed conductor according to claim 1, wherein said electron conductor is obtained by carbonizing at least one selected from a group consisting of aliphatic hydrocarbon, aromatic hydrocarbon and derivatives of the aliphatic hydrocarbon and the aromatic hydrocarbon.
- 10 3. The mixed conductor according to claim 2, wherein each of said aliphatic hydrocarbon, aromatic hydrocarbon and derivatives of the aliphatic hydrocarbon and the aromatic hydrocarbon contains at least one selected from a group consisting of polyacetylene, resorcinol, phenol, phenylphenol,
15 polyaniline, polypyrrole, polythiophene, phenylphosphonic acid, phenylsilane alkoxide, pyrogallol, and dihydroxybiphenyl.
4. The mixed conductor according to claim 1, wherein said electron conductor is made of a carbonaceous material.
5. The mixed conductor according to claim 1, wherein said
20 proton conductor contains at least one selected from a group consisting of a phosphorus-containing compound, a sulfur-containing compound, carboxylic acid, boric acid, and inorganic solid-state acid.
6. The mixed conductor according to claim 1, wherein said
25 electron conductor has consecutive carbon-carbon bonds including a carbon-carbon double bond.
7. The mixed conductor according to anyone of claims 1 to 6, wherein said mixed conductor supports a noble metal catalyst.
8. A mixed conductor wherein an electron conductor made of
30 an inorganic material obtained by carbonizing an organic material

is fixed to a proton conductor made of an inorganic material.

9. The mixed conductor according to claim 8, wherein the electron conductor is fixed to the proton conductor by a covalent bond.

5 10. The mixed conductor according to claim 8, wherein the electron conductor is fixed to the proton conductor by intercalation.

11. The mixed conductor according to claim 8, wherein the electron conductor is fixed to the proton conductor by inclusion.

10 12. A method for producing a mixed conductor comprising:
a first step of obtaining a high molecular precursor by mixing and polymerizing at least one selected from a group consisting of aliphatic hydrocarbon, aromatic hydrocarbon and derivatives of the aliphatic hydrocarbon and the aromatic
15 hydrocarbon with a proton conducting material; and

a second step of burning the high molecular precursor obtained in the first step under an inert atmosphere.

13. A method for producing a mixed conductor comprising:

a first step of obtaining a high molecular precursor by
20 polymerizing at least one selected from a group consisting of aliphatic hydrocarbon, aromatic hydrocarbon and derivatives of the aliphatic hydrocarbon and the aromatic hydrocarbon, and mixing a proton conducting material into said at least one upon polymerization thereof; and

25 a second step of burning the precursor obtained in the first step under an inert atmosphere.

14. A mixed conductor producing method wherein an organic compound is bound or mixed with a compound having movable protons to obtain a high polymer precursor, and said high polymer
30 precursor is carbonized to thereby impart electron conduction

to the precursor.

15. The mixed conductor producing method according to claim 12 or 13, wherein each of said at least one selected from a group consisting of aliphatic hydrocarbon, aromatic hydrocarbon and derivatives of the aliphatic hydrocarbon and the aromatic hydrocarbon is at least one selected from a group consisting of polyacetylene, resorcinol, phenol, phenylphenol, polyaniline, polypyrrole, polythiophene, phenylphosphonic acid, phenylsilane alkoxide, pyrogallol, and dihydroxybiphenyl.

16. The mixed conductor producing method according to claim 12 or 13, wherein said proton conductor contains at least one selected from a group consisting of a phosphorus-containing compound, a sulfur-containing compound, carboxylic acid, boric acid, and inorganic solid-state acid.

17. The mixed conductor producing method according to claim 12 or 13, comprising a third step of causing the product burned in said second step to support a noble metal catalyst.

18. The mixed conductor producing method according to claim 12 or 13, wherein the first step comprises heating the high molecular precursor or heating the high molecular precursor under a pressurized condition.